Certificate no.:
TAP000035R

TYPE APPROVAL CERTIFICATE

This is to certify:

that the Safety Relief Valve for LNG/LPG Service

with type designation(s)
F88

issued to
Flow-Safe, Inc.
Orchard Park, NY, USA

is found to comply with
DNV rules for classification – Ships Pt.5 Ch.7 Liquefied gas tankers
DNV rules for classification – Ships Pt.6 Ch.2 Sec.5 Gas fuelled ship installations – Gas fuelled LNG
DNV rules for classification – Ships Pt.6 Ch.2 Sec.13 Gas fuelled ship installations – Gas fuelled LPG
DNV-OS-D101 – Marine and machinery systems and equipment, Edition July 2021
DNV class programme DNV-CP-0186 – Type approval – Valves

Application:

Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV.

K. factor:	**see certificate**
Temperature range:	**-426°F to +400°F [-253°C to +204°C]**
Max. working press.:	**50-720 psig (3.5 -50 barg)**

Issued at **Hamburg** on **2026-04-13**

This Certificate is valid until **2031-04-12**.
DNV local unit: **Certification & Inspection Services**

Approval Engineer: **Ana Cristina Do Carmo Insfran**

for **DNV**

Digitally Signed By:
Peter von Allwörden
Location: DNV Hamburg, Germany

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.
The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

Product description

F88-3 & F88-4 LP; F88-6, F88-G and F88-J with lift lever is a spring operated PRV that is balanced against the effects of superimposed backpressure without the use of bellows. It is designed for LNG and LPG service.

Sizes:
Connection dimensions: 1/16” (2 mm)
ASME sizing coefficient:
- 3 Gas = 1.06 scfm/psia (slope)
  Liquid = 2.07 gpm/√psid (flow factor)
- 4 Gas = 1.87 scfm/psia (slope)
  Liquid = 3.79 gpm/√psid (flow factor)

Orifice size, area:
- 3, 0.065 in^2 (0.419 cm^2)
- 4, 0.116 in^2 (0.748 cm^2)

Pressure range: 50-720 psig (3.5 -50 barg)

Materials:

Valve part	Material	Standard
Body	Stainless steel	SA-351 CF8M
Spring		302/304/17-7 SS
Spindle		A276/A479 316
Bonnet		S-351 CF8M
Seal	Teflon	-

Design temperature range depending on seat material: -426°F to +400°F [-253°C to +204°C]

K factor:

F88 Equivalent Coefficient of Discharge Kd (Gas)					
Model	F88				
Media	Gas				
Orifice Designation	-3	-4	-8	-G	-J
Slope [SCFM/PSIA]	1,060	1,870	4,200	10,300	27,100
Orifice Area [INCH^2]	0,065	0,116	0,261	0,663	1,690
Equivalent K_d	0,889	0,878	0,878	0,847	0,875
F88 Equivalent Coefficient of Discharge Kd (Liquid)					
Model	F88				
Media	Liquid				
Orifice Designation	-3	-4	-8	-G	-J
Flow Factor [GPM/SQRT(PSID)]	2,070	3,790			
Orifice Area [INCH^2]	0,065	0,116			
Equivalent K_d	0,838	0,859	0,798	0,798	0,798

Application/Limitation

The F88 spring operated PRV may be installed on cargo tanks and in LNG/LPG applications.

Sufficient valve capacity is to be approved for each application.

Materials and material protection chosen for the specific system shall be suitable for the intended medium and environmental conditions. Valves of austenitic stainless steel shall not be used in direct contact with seawater.

The valves covered by this certificate are not to be considered fire safe and therefore shall not be installed wherever fire safe application is required.

The selection of the safety valves for the corresponding operation conditions as well as right installation under consideration of the used materials and media to be discharged have to be in compliance with the instructions of the manufacturer.

Type Approval documentation

Type Approval Application dated 2025-07-22
Type Approval Assessment report dated 2026-03-03
Design analysis: F88 Series Spring Operated dated 2016-12-23
Drawing: F88-3 4 LPW; F88-8-LP; F88-G-NPT; F88-J-NPT
Reports: Cryogenic nitrogen test report F88-4 dated 2026-03-03
Hydrostatic test report: HD-17536-OP dated 2025-11-14
Test report Doc. No.: ETR-003-2025 dared 2025-09-19
DNV Type testing program – Doc. No.: ETR-002-2025 dated 2025-08-19, 2025-09-22
Inspection test plan (ITP)
Assembly and test procedures – Hydrostatic and pneumatic testing No.: ATP-G-002 dated 2025-03-10
Assembly and test procedures – General cleaning No.: ATP-G-004 dated 2013-12-30
Assembly and test procedures – production test of F84L & F88 Series liquid relief valves
No.: ATP-F80-008 dated 2025-04-23
Assembly and test procedures – Assembly / Disassembly of F88 balanced safety valves
No.: ATP-F80-009 dated 2025-06-15

Tests carried out

Hydraulic pressure and leakage test and cryogenic testing.

Production testing

All valves shall be tested in presence of DNV surveyor as below:

1. Hydrostatic test of the valve body at a pressure equal to 1.5 times the design pressure.
2. Test of set pressure at ambient temperature. (With an allowance not exceeding +/- 10% for 0 to 0.15 MPa, +/-6% for 0.15 to 0.3 MPa, +/- 3% for 0.3 MPa and above)
3. Leak test after reset at 90% of each set pressure at room temperature.

Certification

All valves covered by this certificate shall be delivered with a DNV product certificate, if the minimum design temperature is below -55°C or outlet size is not less than 4". Otherwise, manufacturer certificate is accepted.

Materials of the valve body are to be delivered with material certificates in accordance with DNV Rules Part 5, Chapter 7 Section 1 Table 8. All of materials with MC certificate (either issued by society or manufacturer) have to be supplied from an approved manufacturer of DNV.

Production Place

Flow-Safe, Inc.
3865 Taylor Rd, Orchard Park NY 14127, USA

Marking of product

For traceability to this type approval the valves are to be marked as a minimum with:

- Manufacturer's name or trademark
- Design or type designation
- Size (pipe size of valve inlet)
- Set pressure and capacity
- Arrow to indicate direction of flow

Periodical assessment

For retention of the Type Approval, a DNV Surveyor shall perform periodical assessment after two years (+/- 90 days) and after 3.5 years (+/- 90 days) to verify that the conditions for the Type Approval are complied with. Refer to DNV CP-0338, Sec.4.

The certificate is only valid if required periodical assessments are carried out with satisfactory results. To check the validity of this certificate, please look it up in https://approvalfinder.dnv.com

END OF CERTIFICATE